

SESSILISTIGMA, A NEW MONOTYPIC GENUS OF IRIDACEAE–IRIDOIDEAE FROM THE SOUTH WESTERN CAPE

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ABSTRACT

Sessilistigma radians is a new and evidently rare species, the only member of a new genus *Sessilistigma*. It is allied to the southern African genus *Homeria*, and is similar to several species especially of section *Homeria* in its single glaucous leaf, inserted well above the ground and flexuose branching pattern. *Sessilistigma* is distinctive in flower structure, having free stamens and a short vestigial style which divides just above the ovary into three broad, flat, diverging stigmatic arms, each deeply divided. In *Homeria* the filaments are united and the long, slender style is enclosed in the filament column. Basic chromosome number is $n = 6$, and the karyotype, as in *Homeria*, consists of large, acrocentric chromosomes. *Sessilistigma radians* has been successfully crossed with several species of *Homeria*, confirming the evident affinity with this genus suggested by the vegetative morphology.

TITREKSEL

**SESSILISTIGMA, 'N NUWE MONOTIPIESE GENUS VAN DIE IRIDACEAE –
IRIDOIDEAE VANAF DIE SUID-WESTELIKE KAAP**

Sessilistigma radians, 'n nuwe en blykbaar skaars species, is die enigste lid van 'n nuwe genus *Sessilistigma*. Dit is verwant aan die Suider-Afrikaanse genus *Homeria* en stem ooreen met verskeie species veral in die seksie *Homeria* wat sy enkele see-groen blaar, goed bokant die grond ingeplaas, en die golwende vertakkingspatroon betref. *Sessilistigma* word onderskei deur sy blomhou met vry meeldrade en 'n kort vestigiale styl wat net bokant die ovarium in drie breë plat uiteenlopende diep-verdeelde stigma-arms vertak. In *Homeria* is die helmdrade vergroei en die lang dun styl ingesluit in die helmdraadkolom. Die basiese chromosoomgetal is $n = 6$ en die karyotipe, soos in *Homeria*, bestaan uit groot akrosentriese chromosome. *Sessilistigma radians* is suksesvol gekruis met verskeie *Homeria*-species wat die affiniteit, deur vegetatiewe morfologie voorgestel, bevestig.

Key words: *Sessilistigma*, gen. nov., Iridaceae–Iridoideae, south western Cape, chromosome cytology.

INTRODUCTION

Two collections, *Leipoldt 3553* and *Barker 1322*, of an unknown species of Iridaceae, clearly belonging to subfamily Iridoideae subtribe Homeriinae

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FIG. 1
Flowers of *Sessilistigma radians* Goldbl.

(Goldblatt, 1976) came to my attention during my recent studies of the southern African genus *Homeria* (Goldblatt, 1980; 1981). The blackish, reticulate corm tunics, a single, bifacial and channelled leaf inserted above the ground, and flexuose branching pattern correspond closely with several species of *Homeria* particularly those of section *Homeria*. However, the species has a flower with a number of unusual features which made it impossible to refer it to this genus. These floral characteristics include: entirely free stamens; a short, vestigial style; and unusual, deeply forked style arms which extend outwards on either side of the subtending filaments. These features prompted a more extensive study of the relationships of the species in order to determine its phylogenetic position and the true nature of the apparently simple and unspecialised flower combined with a highly derived vegetative morphology.

Both the Leipoldt and Barker collections had vague locality data indicating that the species grew somewhere in the area of Ashton and MacGregor, in the dry, broken plain lying between the Riviersonderend and the Langeberg Mountains east of Worcester, known as the Robertson Karoo. Only after repeated searches in this area of the south western Cape, did I succeed in locating one small population. Plants were discovered growing in semi-

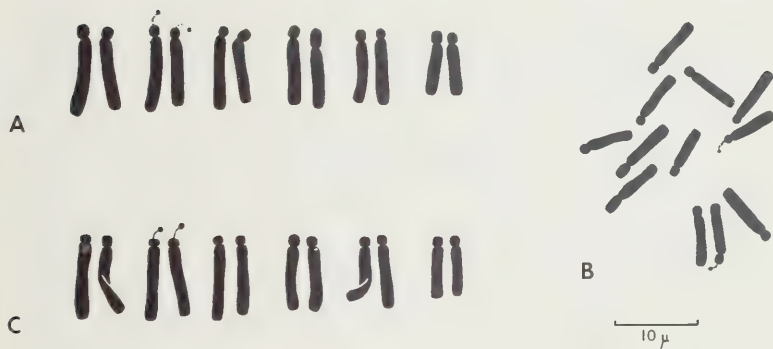


FIG. 2

Mitotic metaphase in *Sessilistigma* and, for comparison, a representative diploid species of *Homeria*: A-B. *Sessilistigma*; C. *H. miniata* (Andr.) Sweet (count reported by Goldblatt, 1980: Fig. 1 A).

karroid scrub at the foot of the Riversonderend Mountains, a short distance east of MacGregor. They corresponded in every detail with the previously collected specimens and with the excellent illustration provided by Barker with her collection.

CYTOLOGY AND HYBRID STUDIES

Chromosome cytology and crossing experiments are especially useful in Iridaceae in determining relationships of taxa (Goldblatt, 1976; 1980) and plants were therefore grown and flowered in the greenhouse.

Chromosome number was determined from mitotic metaphase in root tips, harvested and treated as described in detail elsewhere (Goldblatt, 1979; 1980). Root tip squashes revealed a diploid number of $2n = 12$. The karyotype (Fig. 2 A-B) consists of acrocentric chromosome pairs ranging in size from $6\ \mu$ – $8\ \mu$ long. This matches very closely the karyotypes of species of both *Homeria* (Goldblatt, 1980) and *Hexaglottis* (Goldblatt, 1971 and unpublished) that have the same chromosome number. The karyotype of one species of *Homeria* is illustrated here for comparison (Fig. 2 C).

A series of crossing experiments were undertaken when plants came into bloom. Reciprocal crosses were made with a range of species of *Homeria* and with *Hexaglottis namaquana* Goldbl. ined., the most generalised species of *Hexaglottis*. Results are detailed in Table 1 but can be summarised as follows. All attempts to cross *Sessilistigma* with *Hexaglottis namaquana* failed,

TABLE 1

Results of a crossing program between *Sessilistigma*, *Homeria* and *Hexaglottis* (crosses with *Sessilistigma* as male parent rarely succeeded, perhaps because of the longer styles of *Homeria* sp as compared with *Sessilistigma*).

Species	Attempts	Successes	Comments
<i>Sessilistigma</i> ×:			
<i>Homeria</i> section <i>Namaquana</i>			
<i>H. bolusii</i>	2	0	
<i>H. schlechteri</i>	2	0	
— section <i>Stipanthera</i>			
<i>H. cookii</i>	5	0	
— section <i>Conanthera</i>			
<i>H. fuscomontana</i>	2	1	few seeds produced
<i>H. spiralis</i>	7	7	
— section <i>Homeria</i>			
<i>H. bulbillifera</i>	3	0	
<i>H. flaccida</i>	12	4	undersized capsules, no viable seed very few seed
<i>H. ochroleuca</i>	2	2	
<i>H. pallescens</i>	2	2	
<i>H. patens</i>	5	0	
<i>Hexaglottis namaquana</i> . . .	6	0	

while it was possible to cross the genus with several species of *Homeria*, belonging to sections *Homeria* and *Conanthera*. Almost all crosses using *Sessilistigma* as the pollen parent failed, possibly due to the appreciable longer distance that the pollen has to travel down the stigmas of *Homeria* as compared with those of *Sessilistigma*. With *Homeria* as the pollen parent, successful crosses were obtained especially in section *Conanthera*, where the two species used in the study, *H. fuscomontana* Goldbl. and *H. spiralis* L. Bolus, proved interfertile, *H. spiralis* particularly so (Table 1). Fertility was much lower in crosses between the species of *Homeria* section *Homeria* but succeeded in both directions with *H. pallescens* of this section. Too few crosses were attempted with the remaining sections, *Namaquana* and *Stipanthera* for any valid conclusions to be drawn about their potential intercrossability with *Sessilistigma*. However, the main reason for the crossing studies was only to determine whether the generic relationships of *Sessilistigma* could be assessed at all by such methods, and in this the results are clearly successful.

The conclusion from these experiments is that *Sessilistigma* is closely allied to the vegetatively similar *Homeria* and not to *Hexaglottis*, despite their superficial floral similarities.

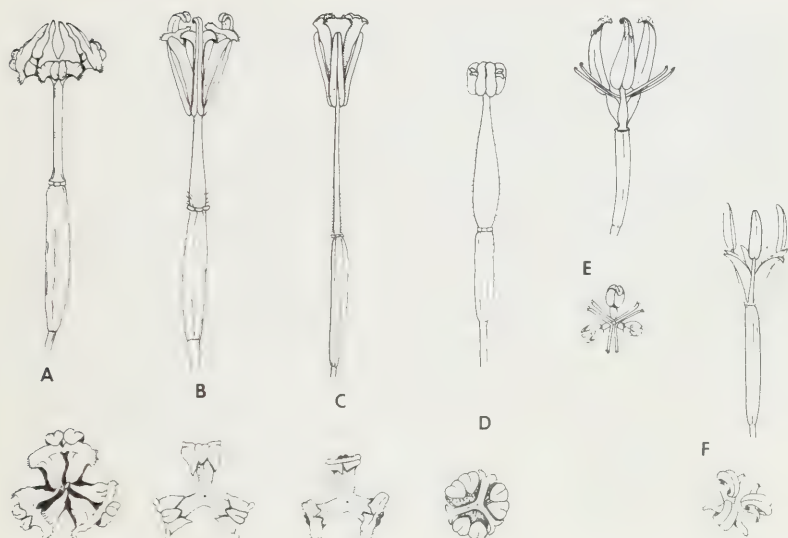


FIG. 3

The gynoecium and androecium in *Sessilistigma* and representative species of *Hexaglottis* and *Homeria*. A. *H. schlechteri*; B. *H. elegans*; C. *H. patens*; D. *H. bifida*; E. *Hexaglottis namaquensis*; F. *S. radians* (side views approx. $\times 2$; top views much enlarged).

MORPHOLOGY OF *HEXAGLOTTIS* AND *HOMERIA*

The floral characteristics of *Sessilistigma* are somewhat reminiscent of *Hexaglottis* (also subtribe *Homeriinae*). However, they differ in several details. The style branches of *Sessilistigma* are compressed, and short and broad, while those of *Hexaglottis* are long and filiform and extend outwards almost horizontally (Fig. 3 E, F). In addition, the style branches of *Hexaglottis* are not sessile, but diverge at the apex of a short but distinct style. The flowers of *Sessilistigma* last 2–3 days and those of *Hexaglottis* are fugitive and typically last only a few hours of the afternoon or evening. The vegetative morphology of *Sessilistigma* and *Hexaglottis* also corresponds poorly. The single, glaucous foliage leaf, inserted above the ground, and the flexuose stem with a few stalked branches of *Sessilistigma* are not matched in *Hexaglottis*. Well-grown individuals of *Hexaglottis* typically have two or more foliage leaves, only rarely inserted above the ground and the stems are straight, rather than flexed, and except in one species, *H. namaqualana*, the

lateral branches are sessile. This lack of correspondence in floral, as well as in vegetative morphology, together with the data from the hybrid studies, suggests strongly that *Sessilistigma* is not directly related to *Hexaglottis* and this possibility has been disregarded.

The vegetative morphology of *Sessilistigma* and *Homeria* correspond well, and it is impossible to distinguish most of the single-leaved species of *Homeria* from *Sessilistigma* in the non-flowering state. However, their floral structure is sharply different (Figs 3, 4). In *Homeria*, the filaments are united entirely or almost so, into a column in which the long slender style is enclosed. The style divides at or near the anther base into three branches which lie closely appressed to the anthers. The style branches may be as long as 8 mm or as short as 1 mm and vary considerably in structure. In sections *Namaquana*, *Stipanthera* and *Homeria*, the style branches are distinctly compressed, about as wide as the anthers and bear subterminal transverse stigmatic lobes, above which there are often short paired erect flaps of tissue known as crests (Fig. 3 A–C). In section *Conanthera* (Fig. 3 D) the anthers are contiguous and partly conceal the short, apically bifid style branches, the ends of which extend between the opposed anthers. The contrast in the structure of *S. radians*, with its virtually sessile style branches and free stamens is marked (Fig. 3 F).

ORIGIN OF *SESSILISTIGMA*

The interpretation that seems best to explain the unusual flower of *Sessilistigma*, in the light of its apparent relationship to *Homeria*, is that what seem to be unspecialised and free stamens are secondary and the ancestral form had united filaments as in *Homeria*. Also, the sessile style branches are so unusual in Iridaceae, that there can be no doubt that the absence of a well-developed style is a specialised feature. The style branches themselves are not much different from those found in species of *Homeria* in which the crests are poorly, or not at all developed (species of section *Conanthera*). Thus it seems reasonable to postulate that *Sessilistigma* arose from section *Conanthera* or from a line leading to this alliance. The limited data from the hybridisation experiments is consistent with this hypothesis, since *Sessilistigma* showed the greatest ability to cross with species of this section.

The question must be raised as to whether *Sessilistigma* should be included in *Homeria* in view of their similarity in vegetative morphology and limited interfertility. This seems to me undesirable. Its inclusion would extend the definition of *Homeria* beyond the normal limits of morphological variability in Iridaceae. It would also reduce the significance of what I believe is a major developmental change in the family. The unusual floral morphology of *Sessilistigma* is most likely based on relatively few genetic muta-



FIG. 4

Morphology and distribution of *Sessilistigma radians*. Whole plant $\times 0.5$, flower $\times 1$, androecium and gynoecium, side and top view $\times 2$, isolated style branches $\times 2$.

tions. These have nevertheless resulted in a profound structural reorganization of the flower. It seems appropriate that this be reflected in the systematics at generic level.

SYSTEMATICS

Sessilistigma Goldbl., gen. nov.

Plantae unifoliateae, caule ramoso, floribus tepalis liberis, unguibus brevibus, *filamentis* liberis, *stylo* vestigiali, ramis stylis bifurcatis filamentos oppositis.

Type species: Sessilistigma radians Goldbl.

Plants with an apically rooting, single internode corm with blackish, coarsely reticulate tunics; *leaf* bifacial, solitary, channelled, inserted well above the ground; *inflorescence* enclosed in opposed, bract-like spathes; *flower* with free, shortly unguiculate tepals; *filaments* free, opposed to the broad, deeply forked style arms; *style* very short, vestigial.

Sessilistigma radians Goldbl., sp. nov. **Figs 1 and 4.**

Type: South Africa, Cape, between MacGregor and Stormsvlei at Steenbokvlakte turnoff, *Goldblatt 5903* (MO, holotype; K, PRE, S, isotypes).

Plants (90-)150–350 mm high. *Corm* globose, 90–150 mm in diameter, tunics black, coarsely reticulate. *Cataphyll* dry, membranous, reaching shortly above ground. *Leaf* solitary, bifacial, channelled, erect below, spreading above, longer than stem, 2 to 5 mm wide, inserted on stem (25-)40–80 mm above the ground. *Stem* erect, flexed above sheathing base of leaf, usually at least 2–3-branched, stem bracts green, 20–35 mm long, entirely sheathing, attenuate, apices brown, branches flexed above sheathing base of bract. *Inflorescence* few to several-flowered, terminal, enclosed in large opposed sheathing, bract-like spathes; *inner spathe* 30–50 mm long, herbaceous, attenuate, apex dry and pale, outer similar but about half as long. *Flower* actinomorphic, buff with tepals bright yellow near base; *tepals* free, unguiculate, with short ascending claws 3–4 mm long, cupped around the base of the filaments and style arms, limbs held more or less horizontally on first opening, slightly reflexed on the second day, *outer* to 30 mm long, obovate, to 17 mm wide, with a conspicuous basal nectary, *inner* to 27 mm long, spatulate, ca. 15 mm wide, with a small basal nectary. *Filaments* free, ca. 4 mm long, opposite outer tepals, appressed to style arms, minutely papillate; *anthers* initially straight and 5 mm long, curving inward and downward after anthesis. *Ovary* to 10 mm long, exserted or included in spathes below; *style* short, ca. 1 mm long, dividing into three broad, yellow ascend-

ing branches ca.2 mm wide, style branches ca.3 mm long, deeply divided with diverging arms, stigmatic at the tips only. Capsule 12–15 mm long, oblong, truncate at apex. Chromosome number $2n = 12$ (Goldblatt 5903).

Flowering time: September–early October.

Distribution: local in the south western Cape, in semi-karroid vegetation at the northern foot of the Riviersonderend Mountains.

SOUTH AFRICA, CAPE—3319 (Worcester): Between MacGregor and Stormsvlei Kloof (-DD), *Leipoldt* 3553 (BOL); Turnoff to Steenboksvlakte, between MacGregor and Stormsvlei Kloof, *Goldblatt* 5903 (K, MO, PRE, S). —3320 (Montagu): Near Ashton (-CC), *Barker* 1322 (BOL, NBG, PRE).

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